IN THE CLAIMS:

1   1. (Currently Amended)   A method for partitioning a pattern into optimized sub-

2   patterns, the method comprising:

3   providing a list of features of the pattern;

4   generating a set of candidate partitions using the list of features of the pattern;

5   scoring each candidate partition of the set of candidate partitions by building sub-

6   patterns using the set of candidate partitions, wherein the scoring includes analyzing an

7   overall suitability of each sub-pattern;

8   determining a best-scoring partition among the set of candidate partitions;

9   applying the best-scoring partition to the list of features so as to provide a

10   plurality of sub-lists of features respectively representing a plurality of optimized sub-

11   patterns.

1   2. (Original)   The method of claim 1, wherein providing a list of features includes:

2   using at least one sub-list from the plurality of sub-lists of features generated by

3   an earlier application of the method as the list of features of the pattern.

1   3. (Original)   The method of claim 1, wherein providing a list of features of the pattern

2   includes:

3   providing an image; and

4   extracting a list of features from the image.

1   4. (Original)   The method of claim 3, wherein extracting a list of features from the

2   images includes:

3   sampling the image so as to provide a regular array of pixels.

1   5. (Original)   The method of claim 3, wherein extracting a list of features from the

2   images includes:

3   using an edge extraction method to provide an edge image; and

4   sampling the edge image to provide a plurality of edge feature points.

1 6. (Original) The method of claim 5, wherein each edge feature point includes the angle

2 of the edge at that edge feature point.

1 7. (Original) The method of claim 1, wherein features of the pattern are 2D image

2 points.

1 8. (Original) The method of claim 1, wherein features of the pattern are points of any

2 dimensionality.

1 9. (Original) The method of claim 1, wherein providing a list of features includes:

2   providing an abstract pattern description; and

3   extracting a list of features from the abstract pattern description.

1 10. (Original) The method of claim 1, wherein providing a list of features includes:

2   providing a pre-generated list of features.

1 11. (Original) The method of claim 1, wherein generating a set of candidate partitions

2 using the list of features of the pattern includes:

3   using a clustering algorithm.

1 12. (Original) The method of claim 1, wherein generating a set of candidate partitions

2 using the list of features of the pattern includes:

3   using a spatial subdivision algorithm.

1 13. (Original) The method of claim 1, wherein generating a set of candidate partitions

2 using the list of features of the pattern includes:

3   using a method that yields sub-lists that include pattern features that span an area

4 of the pattern that is spatially small with respect to the area of the entire pattern.

1 14. (Original) The method of claim 1, wherein generating a set of candidate partitions

2 using the list of features of the pattern includes:

3   using a method that provides sub-lists having pattern features that are more near

4 to each other than to pattern features in other sub-lists.

1 15. (Original) The method of claim 1, wherein generating a set of candidate partitions

2 using the list of features of the pattern includes:

3   building a weighted graph using the list of features of the pattern; and

4   partitioning the weighted graph to generate candidate partitions.

1 16. (Original) The method of claim 15, wherein building a weighted graph using the list

2 of features of the pattern includes:

3   fully connecting the feature points to make a graph; and

4   setting the weights on each link.

1 17. (Original) The method of claim 15, wherein building a weighted graph using the list

2 of features of the pattern includes:

3   sparsely connecting the feature points to make a graph; and

4 setting the weights on each link.

1 18. (Original) The method of claim 16, wherein the weights on each link are based on

2 the distance between each pair of feature points.

1 19. (Original) The method of claim 18, wherein weights decrease as the distance

2 between feature points increases.

1 20. (Original) The method of claim 16, wherein the weights on each link are based on at

2 least one of similarity of angle and similarity of magnitude.

1 21. (Original) The method of claim 16, wherein the weights on each link are based on

2 values associated with the feature points of the pattern.

1   22. (Original) The method of claim 16, wherein the weights on each link are determined

2   such that:

3   larger weights represent a pair of features that tend to be together in the same sub-

4   lists of features; and

5   smaller weights indicate a pair of features that can be included in different sub-

6   lists of features.

1   23. (Original) The method of claim 15, wherein partitioning the weighted graph to

2   generate candidate partitions includes:

3   dividing the weighted graph into two sub-graphs, one of which may be empty;

4   and

5   converting the two sub-graphs into two sub-lists of features.

1   24. (Original) The method of claim 15, wherein partitioning the weighted graph to

2   generate candidate partitions includes:

3   partitioning the weighted graph using a "normalized cut" method to generate

4   candidate partitions.

1   25. (Original) The method of claim 1, wherein in generating a set of candidate partitions

2   using the list of features of the pattern, at least one candidate partition has only a single

3   sub-list of features of the pattern.

1   26. (Original) The method of claim 1, wherein in generating a set of candidate partitions

2   using the list of features of the pattern, each candidate partition has many sub-lists of

3   features of the pattern.

1   27. (Original) The method of claim 1, wherein in generating a set of candidate partitions

2   using the list of features of the pattern, some features included in the list of features of the

3   pattern do not appear on any sub-list of features of the pattern.

1   28. (Original) The method of claim 1, wherein in generating a set of candidate partitions

2   using the list of features of the pattern, at least one feature of the pattern appears on a

3   plurality of sub-lists of features of the pattern.

1   29. (Original) The method of claim 1, wherein scoring each partition of the set of

2   candidate partitions includes:

3   building sub-patterns using the set of candidate partitions; and

4   scoring each candidate partition using a scoring function based on characteristics

5   of a sub-pattern derived therefrom.

1   30. (Original) The method of claim 29, wherein characteristics of the sub-pattern

2   includes:

3   spatial coherence of the features corresponding to the sub-pattern.

1   31. (Original) The method of claim 29, wherein characteristics of the sub-pattern

2   includes:

3   overall spatial size of the area spanned by the feature points corresponding to the

4   sub-pattern.

1   32. (Original) The method of claim 31, wherein the area spanned by the feature points is

2   represented by the smallest bounding box that includes all the feature points.

1   33. (Original) The method of claim 29, wherein characteristics of the sub-pattern

2   includes:

3   the number of feature points in the sub-pattern.

1   34. (Original) The method of claim 29, wherein characteristics of the sub-pattern

2   includes:

3   the total amount of weight in links "cut" by the partition algorithm to create the

4   sub-pattern.

1   35. (Original) The method of claim 29, wherein characteristics of the sub-pattern

2   includes:

3   the overall "suitability" of the sub-pattern used as a search pattern applied to the

4   original pattern.

1   36. (Original) The method of claim 29, wherein characteristics of the sub-pattern

2   includes:

3   spatial coherence of the features corresponding to the sub-pattern;

4   overall spatial size of the area spanned by the feature points corresponding to the

5   sub-pattern;

6   the number of feature points in the sub-pattern;

7   the total amount of weight in links "cut" by the partition algorithm to create the

8   sub-pattern; and

9   the overall "suitability" of the sub-pattern used as a search pattern applied to the

10   original pattern.

1   37. (Original) The method of claim 35, wherein the overall "suitability" of the sub-

2   pattern used as a search pattern applied to the original pattern depends on:

3   the search algorithm used.

1   38. (Original) The method of claim 35, wherein the overall "suitability" of the sub-

2   pattern used as a search pattern applied to the original pattern depends on:

3   degeneracy of the features of a sub-pattern.

1   39. (Original) The method of claim 35, wherein the overall "suitability" of the sub-

2   pattern used as a search pattern applied to the original pattern depends on:

3   redundancy of the sub-pattern within the original pattern.

1   40. (Original) The method of claim 1, wherein determining a best-scoring partition

2   among the set of candidate partitions includes:

3   using a partition score threshold.

1   41. (Original) The method of claim 40, wherein the partition score threshold is settable.

1   42. (Original) The method of claim 40, wherein the partition score threshold is

2   predetermined.

1   43. (Original) The method of claim 40, wherein the partition score threshold includes a

2   portion that is predetermined, and a portion that is settable.

1   44. (Original) The method of claim 40, wherein if no candidate partition has a score

2   above the partition score threshold, then the list of features of the candidate partition is

3   deemed to be one that cannot be usefully sub-divided.

1   45. (Currently Amended)   A method for automatically extracting a plurality of sub-

2   patterns from a pattern in an image, the method comprising:

3   extracting a plurality of features;

4   building a connected graph using the plurality of features; and

5   using the connected graph and a sub-division parameter to create a plurality of

6   feature groups, wherein the sub-division parameter includes an overall suitability of a

7   sub-pattern.

1   46. (Currently Amended)   A method for dividing a pattern into a plurality of sub-

2   patterns, each sub-pattern being adapted for use with an image search method that can

3   provide a plurality of sub-pattern search results, the method comprising:

4   representing the pattern as a plurality of feature points;

5   generating candidate partitions of the plurality of feature points;

6   scoring the candidate partitions by examining characteristics of each potential

7   sub-pattern of each candidate partition, wherein the characteristics of each potential sub-

8   pattern comprises a suitability of the sub-pattern used as a search pattern applied to the

9   pattern;

10   selecting the highest-scoring partition;

11   applying it to the plurality of feature points so as to create one or more sub-

12   pluralities of feature points.

1   47. (Original) The method of claim 46, wherein the sub-pluralities of feature points are

2   used as sub-patterns by an image search method that is adapted to use pluralities of

3   feature points.

1   48. (Original) The method of claim 46, wherein the characteristics of each potential

2   sub-pattern of each candidate partition include:

3   area, number of feature points, and suitability of the sub-pattern for use with a

4   particular search method.